VOLUME - 10, ISSUE - 09, SEPTEMBER - 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Orthopaedics

A PROSPECTIVE STUDY OF A MODIFIED PIN-IN-PLASTER METHOD FOR THE TREATMENT OF FRACTURES OF THE DISTAL RADIUS

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ABSTRACT

Introduction:- The motive of this study is to introduce a modified technique of 'pin in plaster.' that is a favourable treatment option for unstable fractures of the distal radius. This study was shown to narrated a modified technique using 'pin in plaster' that is a favorable treatment option for unstable fractures of the distal radius. A fracture of the distal radius is one of the most customary types of fracture, in the pediatric population fracture was 24% and up to 20% in the elderly, male-to-female ratio of one to four in older age groups.

Methods:- 54 patients with fractures of the distal radius were followed for one year postoperatively. Patients were debarred if they had type B fractures according to AO classification, multiple injuries, or pathological fractures and were treated more than seven days after injury. Radiographic parameters, tilt and height including radial inclination, were measured pre-and postoperatively.

Results:- The radial height was 10.2 mm at the sixth month postoperatively, and the average radial tilt was 10.6° of volar. Three patients of pin tract infection were recorded. There were no cases of pin loosening. Total 73 patients underwent surgery, and three cases of radial nerve irritation were recorded at the time of cast removal. All radial nerve palsies resolved at the six-month follow-up.

Conclusion:- Our modified technique is successfully restoring anatomic congruity and maintaining the reduction in fractures of the distal radius.

KEYWORDS : Fracture of the distal radius, operative treatment, Pin-in-plaster, Modified method of pin-in-plaster.

INTRODUCTION:-

This study was shown to narrated a modified technique using 'pin in plaster' that is a favorable treatment option for unstable fractures of the distal radius. A fracture of the distal radius is one of the most customary types of fracture, in the pediatric population, fracture was 24% and up to 18% in the elderly, male-to-female ratio of one to four in older age groups.[1] Distal radioulnar joint instability is a potential clinical complication that often occurs following this type of fracture, with a rate of incidence of 10% to 19% of cases.[2]There are many conservative and operative treatment methods for fractures of the distal radius, including casting, percutaneous pinning, external fixation, and internal fixation with a plate or combined with external fixation. However, the ability of cast immobilization to keep reduction of comminuted fractures is controversial.[3]This leads to expanding other strategies, such as surgery, that have more accurate reduction and reliable stabilization.[4] External fixators are suitable for highly unstable or comminuted fractures as an adjunct to other forms of fixation. This technique provides ligamentotaxis that helps to keep reduction. Pin and plaster is a quicker and less technically demanding technique compared with others.[5] This technique combines pinning, casting, and external fixation that allows treatment of fractures with minimal devascularisation of the bone.[6]

MATERIALS & METHODS:-

We studied 73 patients, mostly with dorsally comminuted fractures of the distal end of the radius, who received between Jan 2016 to Jan 2017. According to the AO classification, Exclusion criteria were type B fracture, pathological fractures, multiple injuries, and fractures treated more than seven days after injury. Of the 73 patients, 19 were excluded because of incomplete data. 35 of the remaining 54 were female, and 19 were male, with a mean age of 53 years (26 to 73). According to the AO classification, there were twelve A2 fractures, twenty-four A3 fractures, nine C1 fractures, six C2 fractures, and three C3 fractures (Table I). All surgeries were performed under general anesthetic. In addition, manual axial traction and manipulation were needed to restore the normal radial and volar tilt. Fluoroscopy was used intra-operatively to assist the reduction. While the acceptable reduction was achieved, under sterile conditions, two 2.2 mm pins were inserted 7 cm to 10 cm proximal to the fracture site, a distance of 2 cm from each other, and in the direction of posterolateral to anteromedial. one centemeter long incision was made on the posterolateral aspect of the forearm, taking care to avoid the possibility of injuring the surrounding soft tissues and superficial nerves. Another pin was inserted into the base of the second and third metacarpal bones, avoiding incorporating the fourth and fifth metacarpal bones. All pins engaged both cortices of the bone (Fig. 1.a.b). Pins were shortened, the radial side of the metacarpal pin was bent and then remained to protrude out of the skin (about 1 cm to 2 cm) and covered with sterile gauze to protect pins from skin irritation (Fig.1.a.b). After reduction and pin insertion, a short-arm cast was then applied in traction, incorporating the bent pins. Finger and elbow movement was started immediately after the operation, and the limb was elevated and checked for possible compartment syndrome. The radiological review was undertaken within the first week of surgery, at six weeks and one year, by measuring the radial inclination, radial tilt, and radial height. In the third month, the sixth month, first year, and second year, we measured the range of movement (ROM) (flexion, extension, supination, and pronation) using a goniometer. Evaluation of radiographic and functional results were completed by one senior physician (ARM). Pins were removed at the third week. At six weeks, another radiograph was taken to assess the union, and decisions were made regarding the time of cast removal (delayed until the eighth week if necessary). Physical therapy was started after cast removal to return wrist movement and strength.

Fig -1 (A)(B)

Fig-1 (A)(B) An anteroposterior view with two pins inserted proximal to the fracture site. providing a buttress to maintain alignment. Another pin is inserted in the second and third metacarpal bone, with the pin bent at the radial side. Lateral view shows pins which engaged both cortices of the bone, and remained out of the skin.

Table-1:- Demography of patients

Characteristic	Number
Number of patients	54
Gender-M/F	19/35
AO-Type-A	36
AO-Type C	18

Post-operative radiographic results within the first week of surgery showed that the mean radial inclination was 23.7° (22° to 26°), the mean radial tilt was 10.6° (8° to 12°) of volar flexion, and the mean radial height was 10.2 mm . At six-week follow-up, visit the mean radial inclination was 24.5° (22° to 28°), radial tilt into volar flexion was 10.6° (8° to 12°), and the mean radial height was 10.2 mm (9 to 12). At one-year follow-up, the mean radial inclination, radial tilt, and radial height were 24.5° (22° to 28°), 10.1° (8° to 11°), and 10.2 mm , respectively (Table II).

Table-II. Radiographic results. Data are presented as means with ranges

	Pre-operative n = 73	Post-operative n = 73	6 week follow-up (n = 73)	1yrs follow-up n-54
Mean radial inclination(°)	16.7 (13 to 20)	23.7 (22 to 26)	24.48 (22 to 28)	24.53 (22to28)
Mean radial tilt (°)	-24.9 (-21 to -29)	10.6 (8 to 12)	10.6 (8 to 12)	10.1 (8to28)

All of the fractures healed in our series. All patients achieved full range of active finger movement, with no pain and stiffness after complete physical therapy. There were no cases of pin loosening. The ROM in the injured side compared with that in the opposite side at the three-month visit showed that the mean loss of flexion was 14° (10° to 22°), extension was 16.2° (9° to 21°), pronation was 7.7° (5° to 11°), and supination was 12.8° (4° to 16°). At the first-year followup visit the mean loss of flexion, extension, pronation, and supination were 6.7° (2° to 10°), 7.3° (2° to 12°), 0° (-3° to 2°) and 8° (3° to 11°), respectively (Table III).

Table- III:- Loss of range of movement in the injured wrist compared with the uninjured wrist. Data are presented as mean difference between two wrist.

	Three months (n = 64)	Six months (n = 63)	1 year (n = 54)	2 year (n =19)
Flexion	14 (10 to 22)	7 (5 to 10)	6.7 (2 to 10)	6.5 (2 to 9)
Extension	16.2 (9 to 21)	8 (5 to 13)	7.3 (2 to 12)	7.2 (2 to 10)
Pronation	7.7 (5 to 11)	2.7 (-2 to 5)	0 (-3 to 2)	0.2 (-1 to 2)
Supination	12.8 (4 to 16)	8.5 (4 to 10)	8 (3 to 11)	7.8 (3 to 9)

All of them resolved at the six-month follow-up. No cases of median nerve compression or carpal tunnel syndrome were recorded in our series.

There are several operative techniques available to achieve a congruent and stable articular surface and sufficient support for fractures of the distal radius.[1,3] Percutaneous pinning could provide more stability in addition to sufficient support, compared with closed reduction and cast immobilisation alone. However, in a study conducted by Azzopardi, it was shown that percutaneous pinning does not provide better clinical outcomes than cast immobilisation alone. The authors used two crossed Kirschner (K-) wires through the styloid process of the radius and through either Lister's tubercle or the dorsoulnar border of the distal fragment. However, in our study, we have used two pins in the fracture site and another one in the metacarpal bone, which were incorporated into the cast for more stability and support. This technique is both less invasive and technically demanding than open surgery. It is also suitable for reducing extraarticular fractures without intra-articular instability and metaphysical comminution, and in patients with good bone quality. The strength of the present study is the use of the same technique in patients from young to old, with potentially different bone quality.

CONCLUSION:-

Our modified technique is successfully restoring anatomic congruity and maintaining the reduction in fractures of the distal radius. our study supports pin-in-plaster fixation as an excellent technique for the treatment of unstable and comminuted fractures of the distal radius. The technique is less invasive and technically easier than other more complex interventions, and efficiently restores anatomic congruity and maintains reduction.

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